CLAIMS

1. A $Pr_{1-X}Ca_XMnO_3$ (PCMO) spin-coat deposition method for eliminating voids, the method comprising:

forming a substrate, including a noble metal, with a surface;

forming a feature, normal with respect to the substrate surface;

spin-coating the substrate with acetic acid;

spin-coating the substrate with a first, low concentration of PCMO solution;

spin-coating the substrate with a second concentration of PCMO solution, having a greater concentration of PCMO than the first concentration;

baking and rapid thermal annealing (RTA);

post-annealing; and,

forming a PCMO film overlying the surface-normal feature.

2. The method of claim 1 wherein forming a PCMO film overlying the surface-normal feature includes forming a void-free interface between the PCMO film and the underlying substrate surface.

3. The method of claim 1 wherein forming a feature, normal with respect to the substrate surface, includes forming a surface-normal feature selected from the group including a trench and a via.

4. The method of claim 1 wherein spin-coating the substrate with a first concentration of PCMO solution includes applying a PCMO concentration in the range of 0.01 to 0.1 moles (M); and,

wherein spin-coating the substrate with a second concentration of PCMO solution includes applying a PCMO concentration in the range of 0.2 to 0.5 M.

5. The method of claim 1 wherein spin-coating the substrate with acetic acid includes spinning the substrate at a rate in the range between 1500 and 4000 revolutions per minute (RPM) for a time in the range of 30 to 60 seconds.

6. The method of claim 4 wherein spin-coating the substrate with a first concentration PCMO solution includes applying the PCMO solution while spinning the substrate at a rate in the range of 300 to 1000 RPM; and,

wherein spin-coating the substrate with a second concentration PCMO solution includes applying the PCMO solution while spinning the substrate at a rate in the range of 300 to 1000 RPM.

7. The method of claim 1 wherein spin-coating the substrate with a the first concentration of PCMO solution includes spinning the substrate at a rate in the range of at 1500 to 3000 RPM for a time in the range of 30 to 60 seconds; and,

wherein spin-coating the substrate with the second concentration of PCMO solution includes spinning the substrate at a rate

in the range of 1500 to 3000 RPM for a time in the range of 30 to 60 seconds.

8. The method of claim 1 wherein baking and RTA includes:

baking the substrate at a temperature in the range of 120 to 180 degrees C for approximately 1 minute;

baking the substrate at a temperature in the range of 200 to 250 degrees C for approximately 1 minute; and,

rapid thermal annealing at a temperature in the range of 400 to 600 degrees C for a time in the range between 2 and 15 minutes.

9. The method of claim 8 further comprising:

repeating the second concentration of PCMO spin-coating, and baking and RTA procedures 1 to 5 iterations.

10. The method of claim 9 wherein post-annealing includes post-annealing at a temperature in the range of 500 to 600 degrees C for a time in the range of 5 minutes to 2 hours.

11. The method of claim 10 wherein post-annealing includes post-annealing in an environment selected from the group including air and oxygen environments.

12. The method of claim 1 wherein forming a substrate, including a noble metal includes forming a substrate from a material selected from the group including Pt, Rh, Ir, Pt-Rh, Pt-Ir, and Ir-Rh.

13. The method of claim 1 wherein forming a void-free interface between the PCMO film and the underlying substrate surface includes forming voids having a diameter of less than 50 Å between the PCMO film and the substrate surface.

14. The method of claim 1 wherein forming a PCMO film includes forming a PCMO film having a thickness in the range of 400 to 5000 Å.

15. A void-free $Pr_{1-X}Ca_XMnO_3$ (PCMO) film structure, the structure comprising:

a substrate, including a noble metal, with a surface;

a feature, normal with respect to the substrate surface;

a PCMO film overlying the substrate surface; and,

a void-free interface between the PCMO film and the substrate surface.

16. The structure of claim 15 wherein the void-free interface includes voids having a diameter of less than 50 Å between the PCMO film and the substrate surface.

17. The structure of claim 15 wherein the surface-normal feature is selected from the group including a trench and a via.

18. The structure of claim 15 wherein the substrate is a material selected from the group including Pt, Rh, Ir, Pt-Rh, Pt-Ir, and Ir-Rh.

19. The structure of claim 15 wherein the PCMO film has a thickness in the range of 400 to 5000 Å.

20. A resistor RAM (RRAM) memory device with a void-free $Pr_{1-X}Ca_XMnO_3$ (PCMO) film electrode interface, the device comprising:

a semiconductor active region;

a bottom electrode, including a noble metal, with a surface, overlying the active region;

a PCMO film overlying the bottom electrode surface;

a void-free interface between the PCMO film and the bottom electrode surface; and,

a top electrode overlying the PCMO film.

21. The memory device of claim 20 wherein the void-free interface includes voids having a diameter of less than 50 Å between the PCMO film and the bottom electrode surface.

22. The memory device of claim 20 wherein the bottom electrode is a material selected from the group including Pt, Rh, Ir, Pt-Rh, Pt-Ir, and Ir-Rh.

23. The memory device of claim 20 wherein the PCMO film has a thickness in the range of 400 to 5000 Å.